CLAIMS

What is claimed is:

1. A night vision viewer for viewing a low light environment, comprising:

an image intensifier having a light input alignable to the low light environment and a visible light output adapted for viewing by a user; and

a supplemental light source having a light output aligned to the image intensifier input, the light source being configured to emit light in a pattern corresponding to a desired supplemental image.

2. The night vision viewer of claim 1 wherein the supplemental light source produces light at an infrared wavelength.

3. The night vision viewer of claim 1 wherein the supplemental light source includes:

a light emitter having an electrical input terminal and an optical output, the light emitter being configured to produce light at a first wavelength at the optical output in response to an input signal at the electrical input terminal; and

a scanner assembly having an optical input aligned to receive light from the optical output, the scanner assembly being configured to deflect the input light through a periodic scan pattern.

4. The night vision viewer of claim 3 wherein the light emitter is operative to emit infrared light in response to an input electrical signal.

5. The night vision viewer of claim 3 wherein the light emitter includes an infrared light emitting diode.

6. The night vision viewer of claim 5 wherein the light emitter includes an external modulator having an input port positioned to receive light from the light emitting diode and an output port, the external modulator further including a modulation input terminal coupled to the electrical input terminal.

7. The night vision viewer of claim 3 wherein the light emitter includes an infrared laser diode.

8. The night vision viewer of claim 7 wherein the light emitter includes an external modulator having an input port positioned to receive light from the laser diode and an output port, the external modulator further including a modulation input terminal coupled to the electrical input terminal.

9. The night vision viewer of claim 1 wherein the supplemental light source includes a LCD panel and a back light.

10. An augmented night vision viewer for simultaneously viewing a low light environment and supplemental image, comprising:

an infrared light sensitive image intensifier having an input aligned to the low light environment, the image intensifier being responsive to infrared light from the low light environment to produce a visible image corresponding to the low light environment; and

an infrared emissive source having a signal input, an infrared light emitter coupled to the signal input and responsive to an electrical signal at the signal input to emit infrared light, and an infrared output aligned to the image intensifier, the source being responsive to the electrical signal to direct the infrared light onto the image intensifier.

11. The night vision viewer of claim 10 wherein the emissive source includes a scanner that scans the infrared light onto the image intensifier in a pattern corresponding to the electrical signal.

12. The night vision viewer of claim 10 wherein the light emitter includes an infrared laser.

13. The night vision viewer of claim 12 wherein the light emitter further includes a modulator aligned to receive light from the infrared laser and operative to modulate the received light according to image information.

14. The night vision viewer of claim 10 wherein the light emitter includes a matrix addressable display.

15. The night vision viewer of claim 14 wherein the matrix addressable display includes:

a transmissive LCD panel; and

an infrared back light.

16. The night vision viewer of claim 14 wherein the matrix addressable display includes:

a reflective LCD panel; and

an infrared frontlight.

17. A night vision apparatus for viewing an auxiliary image, comprising:

an auxiliary signal source responsive to produce an electrical signal corresponding to the auxiliary image;

an infrared source having an electrical input coupled to the auxiliary signal source, the infrared source being responsive to the electrical signal to emit infrared light corresponding to the auxiliary image; and

an infrared viewer positioned to receive the infrared light from the infrared source and responsive to the infrared light to produce a visible image corresponding to the infrared light.

18. The night vision apparatus of claim 17 wherein the infrared source includes an infrared laser.

19. The night vision apparatus of claim 18 further including an external modulator aligned to receive light from the laser and coupled to receive the electrical signal corresponding to the auxiliary image, the modulator being responsive to modulate the received light according the electrical signal corresponding to the auxiliary image.

20. The night vision apparatus of claim 18 wherein the infrared laser is a laser diode.

21. The night vision apparatus of claim 17 wherein the infrared viewer is a head mounted configuration including a head mountable support and wherein the

infrared source is sized and configured for attachment to the head mountable support.

22. The night vision apparatus of claim 17 wherein the auxiliary signal source includes a remote signal input adapted to receive signals from a remote signal source.

23. The night vision apparatus of claim 22 wherein the remote signal input is a rf antenna.

24. A night vision training environment, comprising:

a portable night vision simulator, including:

an NVG having an IR input;

an IR display mounted to the NVG and having an IR output alignable to the IR input;

a receiver coupled to the IR display and configured to produce input signals for the IR display;

an electronic controller that produces control signals for the portable night vision simulator; and

a transmitter having a signal input coupled to the electronic controller, the transmitter being configured to transmit to the receiver signals corresponding to the control signals.

25. The night vision training environment of claim 24 wherein the IR display includes:

a modulated IR source responsive to the input signals to emit IR light; and

a scanning assembly aligned to receive the emitted IR light and responsive to scan the received IR light onto the NVG input.

26. The night vision training environment of claim 24 wherein the IR display includes:

an IR emitter responsive to the input signals to emit IR light; and

an LCD panel responsive to the input signals to selectively transmit the IR light to or reflect the IR light to the NVG input.

27. The night vision training environment of claim 26 wherein the IR display includes a field emission display, the field emission display including an IR emissive screen.

28. The night vision training environment of claim 24 wherein the transmitter is a rf transmitter.

29. The night vision training environment of claim 24 further comprising:

a second portable night vision simulator, including:

a second NVG having a second IR input;

a second IR display mounted to the second NVG and having a second IR output alignable to the second IR input; and

a second receiver coupled to the second IR display and configured to produce respective input signals for the second IR display.

30. The night vision training environment of claim 29 wherein the electronic controller is programmed to provide data independently to each of the portable night vision simulators.

31. The night vision training environment of claim 24 wherein the transmitter is a rf transmitter.

32. A display device that produces a visible image in response to an input image signal, comprising:

a screen, including a base plate and a wavelength converting coating responsive to output light of a first wavelength in a visible range in response to light of a second wavelength;

a light source operative to emit modulated light of the second wavelength in response to the image signal; and

a scanner assembly having an input aligned optically to receive light from the light source and an output aligned optically to direct the light

received at the input to the screen, the scanner assembly being responsive to a driving signal to scan the received light onto the wavelength converting coating in a periodic pattern.

33. The display of claim 32 wherein the first wavelength is a non-visible wavelength.

34. The display of claim 32 wherein the scanner assembly includes a mirror mounted for pivotal movement about an axis of rotation.

35. The display of claim 32 wherein the scanner assembly includes a microelectromechanical scanner having a mirror positioned to deflect the light received at the input.

36. The display of claim 35 wherein the microelectromechanical scanner is biaxial.

37. The display of claim 32 wherein the wavelength converting coating is an infrared sensitive phosphor and the second wavelength is an infrared wavelength.

38. The display of claim 32 wherein the wavelength converting coating is a visible wavelength sensitive phosphor and the second wavelength is a visible wavelength.

39. The display of claim 32 wherein the wavelength converting coating is an ultraviolet wavelength sensitive phosphor and the second wavelength is an ultraviolet wavelength.

40. The display of claim 32 wherein the light source includes a directly modulated light emitter.

41. The display of claim 40 wherein the directly modulated light emitter is a laser diode.

42. The display of claim 32 wherein the directly modulated light emitter is a non-coherent light emitter.

43. The display of claim 32 wherein the light source is a matrix addressable emitter.

44. The display of claim 43 wherein the matrix addressable emitter includes a LCD panel.

45. The display of claim 44 wherein the matrix addressable emitter further includes an infrared light emitter and wherein the LCD panel selectively transmits or reflects infrared light from the infrared light emitter.

46. The display of claim 45 wherein the infrared light emitter includes an infrared light emitting diode.

47. The display of claim 43 wherein the matrix addressable emitter includes a plasma-based emitter panel.

48. The display of claim 43 wherein the matrix addressable emitter includes a cathode ray tube.

49. An apparatus for providing infrared input to a night vision viewer having an infrared input port, comprising:

an infrared emitter adapted for coupling to the night vision viewer, the infrared emitter being responsive to supply infrared light to the infrared input port in response to an electrical signal; and

an electronic signal generator having an electrical output coupled to the infrared emitter and a data input, the signal generator being operative to produce the electrical signal at the electrical output in response to image data at the data input.

50. The apparatus of claim 49 further including a mechanical mounting fixture adapted to support the infrared emitter in alignment with the night vision viewer.

51. The apparatus of claim 49 wherein the infrared emitter includes a directly modulated infrared diode.

52. The apparatus of claim 51 wherein the directly modulated infrared diode is a laser diode.

53. A viewing simulator for simulating viewing of an environment through an optical imaging device, comprising:

an image signal source that produces an image signal corresponding to a portion of the environment;

a primary viewing device having an input port configured to receive electromagnetic energy that is not visible to a user without a viewing aid, the primary viewing device being responsive to the electromagnetic energy that is not visible to the user without a viewing aid to provide visible light for viewing by the user, the visible light corresponding to the received electromagnetic energy; and

an electromagnetic emitter responsive to the image signal to emit the electromagnetic energy that is not visible to the user without a viewing aid, the electromagnetic energy being modulated in a pattern corresponding to the portion of the environment.

54. The viewing simulator of claim 53 wherein the electromagnetic emitter includes an infrared laser.

55. The viewing simulator of claim 54 further including an external modulator aligned to receive light from the laser and coupled to receive the electrical signal corresponding to the auxiliary image, the modulator being responsive to modulate the received light according the electrical signal corresponding to the auxiliary image.

56. The viewing simulator of claim 54 wherein the infrared laser is a laser diode.

57. The viewing simulator of claim 53 wherein the electromagnetic emitter includes an ultraviolet emitter.

58. The viewing simulator of claim 53 wherein the infrared viewer is a head mounted configuration including a head mountable support and wherein the infrared source is sized and configured for attachment to the head mountable support.

59. The viewing simulator of claim 53 further including a remote signal source includes a remote signal source coupled to the electromagnetic emitter.

60. The viewing simulator of claim 59 wherein the remote signal source includes a rf antenna.

61. A simulated training environment that provides images to a user, comprising:

a portable night vision viewer configured for wearing by the user;

a gaze tracker, oriented to detect a gaze direction of the night vision viewer, the gaze tracker providing a tracking signal indicative of the detected gaze direction;

an electronic controller coupled to receive the tracking signal and responsive to the tracking signal to produce output data corresponding to a selected image portion; and

an infrared image source having a signal input coupled to the electronic controller and an infrared output alignable to the night vision viewer, the infrared source being responsive to the output data to emit infrared light in a pattern corresponding to the selected image portion at the infrared output.

62. The simulated training environment of claim 61 wherein the infrared image source includes an infrared laser and a scanner oriented to scan the infrared light onto the night vision viewer.

63. A method of providing a visible image to a user, comprising the steps of:

modulating light of a first wavelength with image information;

scanning the light of a first wavelength in a periodic pattern; and

converting the scanned light of the first wavelength into light of a second wavelength.

64. The method of claim 63 wherein the step of modulating light with image information includes the steps of:

emitting continuous wave light of the first wavelength with a light source; and

modulating the continuous light with an external amplitude modulator separate from the light source.

65. The method of claim 63 wherein the step of scanning the light of the first wavelength in a periodic pattern includes directing the light through a substantially raster pattern.

66. The method of claim 63 wherein the step of scanning the light of the first wavelength in a periodic pattern includes redirecting the light with a scanning mirror.

67. The method of claim 63 wherein the step of converting the scanned light of the first wavelength into light of a second wavelength includes applying the scanned light to a photo-luminescent material.

68. The method of claim 67 wherein the photo-luminescent material includes a phosphor.

69. The method of claim 63 wherein the step of converting the scanned light of the first wavelength into light of a second wavelength includes applying the scanned light to an image intensifier tube of a night vision goggle.

70. A method of simulating viewing a low light environment, comprising the steps of:

producing light of a first wavelength;

modulating the produced light of the first wavelength with image information;

scanning the modulated light of a first wavelength in a periodic pattern onto an input of a night vision goggle; and

converting the scanned light of the first wavelength into light of a second wavelength with the night vision goggle.

71. The method of claim 70 wherein the first wavelength is an infrared or near infrared wavelength.

72. The method of claim 70 wherein the step of scanning the modulated light includes resonantly scanning the modulated light in a substantially raster pattern.

73. The method of claim 70 further including the steps of:

determining a viewing direction of a user; and

producing the image information in response to the determined viewing direction.

74. The method of claim 70 wherein the step of producing the image information in response to the determined viewing direction is performed at a location remote from the night vision goggle.

75. The method of claim 74 further including the steps of:

transmitting the image information from the remote location to the night vision goggle; and

receiving the image information at the night vision goggle.

76. A method of producing an image for viewing by a user, comprising the steps of:

producing an electrical image signal corresponding to the image to be viewed;

applying the image signal to an image source;

emitting infrared light in response to the applied image signal;

directing the emitted infrared light to an image intensifier; and

emitting visible light with the image intensifier in response to the directed infrared light.

77. The method of claim 76 further including the steps of:

determining a viewing direction of the user; and

identifying the image in response to the determined viewing direction.

78. The method of claim 76 wherein the step of identifying the image in response to the determined viewing direction. is performed at a location remote from the user.

79. The method of claim 78 further including the steps of:

transmitting the image information from the remote location to the user's location; and

receiving the image information at the user's location.

80. A method of simulating a night vision environment, comprising the steps of:

producing a light beam of a non-visible wavelength modulated according to a desired image;

scanning the light beam onto a night vision viewer; and

emitting light with the night vision viewer in response to the scanned light beam.

81. The method of claim 80 wherein the non-visible wavelength is an infrared or near infrared wavelength.

82. The method of claim 80 wherein the step of scanning the light beam includes resonantly scanning the light beam in a substantially raster pattern.

83. The method of claim 80 further including the steps of:

determining a viewing direction of a user; and

identifying the desired image in response to the determined viewing direction.

84. The method of claim 83 wherein the step of identifying the desired image in response to the determined viewing direction is performed at a location remote from the user.

85. The method of claim 84 further including the steps of:

producing image information in response to the identified desired image:

transmitting the image information from the remote location to the night vision viewer; and

receiving the image information at the night vision viewer.

86. A method of simulating operation in a low light environment, comprising the steps of:

providing a portable, occluded night vision viewer to a user;

detecting a gaze direction of the user;

in response to the detected gaze direction, identifying a portion of the low light environment;

producing an infrared signal corresponding to the identified portion of the low light environment;

inputting the produced infrared light to the night vision viewer; and

producing visible light for viewing by the user with the night vision viewer, in response to the infrared input signal.

87. The method of claim 86 wherein the step of inputting the produced infrared light to the night vision viewer includes scanning the infrared light onto an image intensifier of the night vision viewer.

88. The method of claim 87 wherein the step of scanning the infrared light onto an image intensifier of the night vision viewer includes resonantly scanning the light beam in a substantially raster pattern.